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Opportunities for International Cooperation in Planetary Exploration

Abstract

Space exploration started as a super power contest to attract favorable acclaim to each side. As such, it was very nationalistic with one group pitted against another. With the end of the cold war, the character of this endeavor has changed to multi-national, multi-cultural quest to understand our nearest celestial neighbors. Teams composed of members of several nations are now the norm. While there has been modest encouragement from national space agencies, a stronger factor has been the common interest in intriguing scientific problems and the natural coalescence of scientists across the world. Growth of the World Wide Web has facilitated collaboration on a global scale. The situation is ripe for African participation.

This paper will describe some examples for international cooperation in the recent past suggesting some routes by which African scientists can participate in this exciting endeavor.

Planetary Exploration with Spacecraft--Looking back and looking forward

1. Abstract

Human beings have long wondered at the "wandering stars" in the night sky. In the last few hundred years, we have come to recognize these as planets orbiting the sun. The invention of the telescope changed these from points of light to disks with visible, and variable markings. But in the last three decades, our understanding of these bodies has changed immensely through close up views from spacecraft.

The first spacecraft to visit another planet were launched in the 1960s. Since then, a handful have flown successfully to their destination lending insights into these worlds. This presentation reviews the modern history of planetary exploration focusing on the change in human understanding of our nearest neighbors. A comparison of our pre-space age ideas about the planets will be compared to those of today.

If one extrapolates into the next few decades, it is possible to speculate on even more dramatic changes in understanding as more intensive and capable machines move throughout the solar system.

2. Pre-space age understanding of planets
   - Mercury
   - Venus
   - Mars
   - Jupiter
   - Saturn
   - Uranus
   - Neptune
   - Pluto
   - Small bodies
3. Successful missions to date
   - Tabular description of all flights Mariner 2 to Venus in 1962 through Mars Pathfinder, Mars Global Surveyor and Galileo in late 90s
4. Current understanding of planets
   - Mercury
   - Venus
   - Mars

- Jupiter
- Saturn
- Uranus
- Neptune
- Pluto
- Small bodies

5. Changes--what we believe today vs what we believed yesterday
   - Nature of the planets themselves
     - Atmospheres
     - Solid bodies
     - Magnetic and radiation environments
     - Surfaces
     - History
     - Satellites and rings
   - Implications about the formation of the solar system
     - Role of impacts
     - Inferred early history
6. Prospects for the future
   - Missions en route
     - NEAR
     - Stardust
     - Mars Polar Lander--arrives 3 December 1999
     - Casini--arrives July 2004
   - Missions in development
   - Missions in concept
   - Beyond concepts
     - Prospects for robotic outposts
     - Prospects for human explorers

Opportunities for International Cooperation in Planetary Exploration

1. Abstract
2. History of international competition
   - USSR, US, Europe
3. First elements of cooperation
   - European Space Agency
   - Soviet block
   - United States
4. Current cooperative missions
   - US led
   - Europe led
5. How does one get into this game?
   - Formation of science partnerships and collaboration with colleagues on international basis
   - Formation of teams to propose on upcoming opportunities
   - ESA and NASA solicitations
6. Prospects for the future--
   - Science increasingly internationalized
     - Improved communications allows many parties to be at the frontier simultaneously
     - Common, intriguing questions shared broadly
     - Internet facilitates joint work across wide geographic, cultural and time boundaries
   - Space missions becoming less expensive and more frequent
     - Two planetary missions launched in the 80's vs XXX launched in the 90's
     - Concomitant increase in opportunities for participation
   - International collaborative missions becoming more common than national missions
     - Widens the net of participants